

in Washington seventeen years, and they were trying to get him home to die. Just my luck to take him on my run. Our competing company had refused to take him, as it was required that he be delivered dead or alive. The day before sailing our manager called me and asked if I would undertake it, and, being of an adventurous nature, I said, yes. Now, what was I to do? I didn't know how to embalm, so I rushed up to one of the elite mortuaries on Riverside and the head embalmer told me he could teach me in a short while so I could get by at least. So I went to school, one night! I worked frantically all night and all the next day, and came out with six bodies to my credit; and could take care of my own end results!

Just as I reported for duty the next afternoon they brought my patient on board and placed him in the most luxurious suite we had. He had been brought from Washington on a special train. When I stepped into his cabin in uniform and stood at attention, he asked his wife, "¿A quien tenemos aquí?" (Whom have we here?) Quick as a flash I answered, "El médico del vapor, señor, servidor de usted." (The ship's surgeon, sir, at your orders.) That's the way you have to say it in Spanish. Seventeen long days by fast steamer to his home and the company did not expect him to live five days. Surely I will be pardoned if I say that I lost no time. I played my trump without waiting. Our manager had said that if there was anything I needed, to spare no expense; he would put it on board for me. I had, therefore, provided myself with two of the very best tonics, both well known to the medical profession; not in the hope of saving his life, but simply to prolong it, if possible, to his home port. After a few doses I heard him say to his wife, "I feel better, something is getting a grip on me."

Then the fight was on in earnest. The nurse and I took turns just as the officers on watch. Stimulants, tonics, ice-packs, everything we could think of to give comfort and stay the ravages against the fighting army of white blood corpuscles. Already 150,000 (the normal count is from 8,000 to 12,000), the count steadily arose to 1,000,000. He was literally burning up alive!

This was the most thrilling experience I ever had in a fight with that grim monster to whom we must all inevitably yield. There were on board bankers, statesmen and presidents of big business. The eyes of the medical profession of the capitals of two great nations were on one poor little ship doctor to see what he would do. A daily bulletin must be broadcast. At Rio de Janeiro the ambassadors of three nations came aboard to pay their respects. The substituting ambassador passed us on the high seas and saluted. Need I describe my feelings?

We were steaming out of Santos, Brazil, when he died, fifteen days out and only three days from home! I choked down my feelings and set myself to the grim task of embalming. It took me four hours to do the job to my satisfaction, for I had taken him the Tutankamen way, and his people

seemed pleased with the way he looked. Our officers came down off the bridge and acted as pall-bearers, and we let him lie in state in our lounge, the casket draped in his national colors. On arrival he was received in military pomp, the President, himself, attending.

#### AFTERTHOUGHTS

"Doctor, do you like to work on a ship?"

"Yes, why not?"

"Doesn't it get awfully monotonous?"

"No, we are constantly going. In the course of time we get to all the ports of the world. Then the personnel changes with every voyage. Sooner or later we meet the leading celebrities of all lands. I have enjoyed this close personal touch in a very pleasant way with so many nice people whom I never would have known otherwise."

It is our privilege to treat all kinds of people, from the humblest immigrant to the world's most famous characters, Hollywood celebrities, New York's high-powered business men, senators, ambassadors, premiers and world conference delegates are among our patients. In fact, it so happened recently that the Secretary of State of the United States with his entire committee and secretaries honored us by traveling on our ship en route to the London Economic Conference. He graciously stood with the doctor for a photograph, which is prized as an invaluable possession.

As to monotony, what is more monotonous than a doctor's life on shore? From bedside to office, office to hospital, day and night in a ceaseless round, year in and year out, with very little time for vacation. It is like being chained to one's oars forever.

And then, if I can do any good to this worldwide clientele, thousands of ships that carry no doctors but reach us by radio, multitudes of passengers of all kinds and nationalities, our own crews of sturdy fellows who happen to all sorts of accidents—if I can do any good, I say, with kind sympathetic treatment, with a happy smile and a cheerful word, as I go on my way, I shall not have lived in vain.

Steamship *Virginia*, Panama-Pacific S. S. Line.

#### TREATMENT OF LACERATED SOFT PARTS

By EDMUND BUTLER, M.D.

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Discussion by Clinton D. Collins, M.D., Fresno; Lane Falk, M.D., Eureka; Dudley V. Saeltzer, Jr., M.D., Sacramento.

THE character and extent of the debridement in lacerated wounds is influenced by the following factors:

1. History of the accident. Special emphasis on the injuring forces, the location of the accident and probable contamination of the injuring instrument.

2. Careful examination of the clothing, as to missing portions, rents and tears, in the region of the wound.

3. Past history of the individual, especially inquiring into previous infections and any lack of resistance to infection.

4. The extent and number of the injuries, and the blood supply to the part.

5. The condition of the patient as regards shock. Amputations may be delayed until general condition improves.

6. Condition under which you rendered treatment, as to the presence of hospital and proper equipment. First aid in all of its refinement may be given in a modern hospital; and only hemorrhage control, splinting, and a simple protective dressing should be carried out along the highway.

#### AIM IN TREATMENT

Our desires in the treatment of all wounds is primary healing, but there are three main factors tending to interfere: The most important is the presence in the wound of bacteria-bearing foreign material. The next is the presence in the wound of devitalized tissue. And third, there is the introduction of pathogenic bacteria into the wounds by the injuring instrument.

#### PROCEDURES IN TREATMENT

The great problem, therefore, is: Are we able to perform the necessary debridement and soft-tissue repair without introducing more bacteria, or traumatizing tissue, so that the ever-present skin flora may be activated? What do we hope to have following our repair? A wound free of foreign material, devitalized tissue, and bacteria? The simplest procedure to relieve the wound of these insulting foreigners is most desirable. The one condition that so often excites the patient, and frequently befuddles the surgeon, is hemorrhage. There are just two things that sometimes come into the mind of physicians when confronted with the lacerated, bleeding wound: first, the control of bleeding, and second, the suturing of the skin, often overlooking severed tendons and severed nerves. Hemorrhage must be controlled, and if unable to make sufficient pressure with sterile gauze directly over the wound, the tourniquet, preferably a blood pressure apparatus cuff, should be applied. A careful examination is now made for cut tendons and nerves. This finished, the skin adjacent to the wound (the immediate wound being covered with gauze) is prepared by shaving, cleansing with ether or benzine, washing with alcohol and painting with any of the efficient skin antiseptics. The edge of the gauze is now raised sufficiently to expose just the margin of the skin on one side of the wound, and this remaining skin is prepared in the same manner. The clean skin is now covered with a piece of fresh gauze, and a similar preparation of the other skin margin is carried out. We are now confronted with the surgically prepared skin field up to the margin of the wound. The immediate edges of the skin are excised with a sharp knife, the wound margins are retracted and elevated, and the wound is irrigated with peroxid and sterile water, 1 to 5 being of sufficient strength. The removal of clots and hair, and particles of clothing may be aided by sponging with a small sponge mounted on a Mayo clamp. Continue the irrigation until all regions

of the wound have been reached, occasionally washing away the froth with sterile saline solution, to inspect the depths of the wound. Look for foreign bodies, soft tissues impregnated with dirt and bits of devitalized soft parts. It may be necessary to irrigate many times before all foreign material has been removed. When the extent of the injury is ascertained, explore the entire wound with the gloved finger. Local anesthesia will be necessary. The tourniquet is gently loosened, and bleeding vessels are sutured if possible, and otherwise clamped and ligated. The cut end of the vessel is usually seen and is secured without injury to near-by veins or nerves. Such injury nearly always occurs when diving into a bleeding wound, and blindly attempting to clamp vessels.

#### OTHER FACTORS TO BE CONSIDERED

Now is the time the decision has to be made as to:

1. Immediate repair of tendons or nerves.

2. Whether only the skin is to be closed, and if infection does not take place, secondary repair to be made later.

3. Whether the wound is to be packed and allowed to heal by granulations. If you are reasonably careful in your mechanical cleansing, and it has been possible to remove all gross contamination, immediate repair is performed. Fine silk on small round needles is used for the approximation of nerves, and heavy braided silk for tendons. As each tendon end is located, the suture being placed in such a way as to leave the two ends of the suture protruding from the cut end of the tendon, all further traction is made on the suture, and if the tendon retracts within the sheath no difficulty is encountered in the relocation of the tendon. After all sutures have been placed in all located cut tendon ends, the patient may be asked to make movements, aiding in the identification of each individual tendon. It is not uncommon in the volar surface of the wrist to suture the cut end of the median nerve to a tendon. Kanaval mentions this error repeatedly. If possible, it is well to repair the rent in the sheath of the tendons with fine silk or fine catgut. It is well to place the extremity in such a position that the wound in the tendons and the wound in the sheath will be in different planes.

#### SPECIAL MEASURES

There are a few points in the technique of locating tendons which it may be well to mention. Sometimes the wound has to be extended in the direction of the tendons. Bunnell makes a small incision proximal to the wound, locates the tendon, and pushes it through to the original wound. Usually approximation of the origin and insertion of the muscle, as in flexing the elbow and the wrist and the fingers, is sufficient to cause the cut ends of the tendon to protrude. Squeezing the belly of the muscle may produce sufficient elongation to push the tendon out of the wound. Tight bandaging of the forearm, beginning at the elbow, may be required to help find cut tendons. A slender Allis clamp, such as that designed by Judd for common duct surgery, may be passed into the sheath and grasp the cut tendon and help with

its delivery, always remembering to be as gentle and atraumatic as possible with all soft parts. Placing the suture immediately on location of the tendon does away with much handling and crushing. The annular ligament or fascia may be approximated with fine silk or fine chromic gut. I prefer to use interrupted fine silk in the skin. A light plaster dressing or molded splint, relieving the tension on the muscles and tendons, is necessary. The general condition of the patient must be watched: he should be allowed a reasonable diet, a moderate use of alcohol and tobacco, and necessary regulation of the bowels and a mild sedative to insure sleep.

The wounds are always dressed with compresses of glycerin and alcohol. There is at times more or less induration of the wound and considerable rise in temperature. This does not call for opening of the wound or blind probing for purulent infection. A reasonable delay is often rewarded by the disappearance of the swelling. After suppuration does occur, free drainage must be instituted, and occasionally fair functional results are had in the presence of low grade infection, suppurative in type.

Passive motion should be instituted following repair and continued daily. Five to seven weeks, depending upon the condition of the patient and the blood supply of the part, are required for union of the tendon.

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#### DISCUSSION

CLINTON D. COLLINS, M. D. (Physicians' Building, Fresno).—The principles outlined by Doctor Butler in handling lacerated soft parts are undoubtedly sound and should serve as a standard, or as nearly so as such surgical treatment can be standardized.

The time element is a very important one. Most patients now come directly to hospitals, or they can be removed there within a short time after the injury occurs.

Unless there is definite contraindication, the repairs should be made immediately. Even though the surgeon cannot be sure of a clean wound, a large majority will repair by primary healing. If suppuration does occur, the gap between severed tissues is lessened and secondary repair is easier.

It is usually better to remove soiled or devitalized tissue with a sharp knife than to try to scrub it clean.

The three important factors brought out in this paper, it seems to me, are:

1. Immediate surgical repair should be done in most cases.
2. There must be sufficient debridement of damaged tissue.
3. Accurate approximation of all severed tissues is necessary for restoration of function, as well as cosmetic results.

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LANE FALK, M. D. (First National Bank Building, Eureka).—There is little that I can add to the subject under discussion, except to advise the reader to re-read Doctor Butler's article several times; it will come in handy in the daily work of the general surgeon. I would like to reemphasize and add some of the following points:

1. Remember your anti-tetanus serum in these cases.
2. All lacerated and contused wounds are infected. Treat them as such.
3. After the primary application, use antiseptics sparingly, and debridement primarily as little and gently as possible. It is surprising that what appears to be hopelessly devitalized tissue at the onset, revitalizes itself in forty-eight hours. If the tissue does not appear to be coming back in forty-eight hours,

it then can be trimmed off with little or no pain. It has been my experience that ordinary warm saline irrigations, and keeping the parts at absolute rest, by splints, etc., as well as keeping the area dry by means of screen-elevated protectors, or wire elevators, save tissue and prevent infection. Continuous wet dressings devitalize tissue. Intermittent, hot boric compresses, such as one hour on and four hours off, help to bring back the blood supply and clean up tissue.

4. Control hemorrhage while working, which allows for perfect vision; and see that all parts are thoroughly dry after working. Quite often subcutaneous hematomas can be aspirated and controlled by a pressure dressing, as a rubber sponge is incorporated in the dressing, and an ace bandage is used to give pressure.

5. I feel that regional nerve blocks, *e. g.*, brachial plexes, caudal, spinal or gas is preferable to direct local infiltration in these cases. It is quite obvious that injecting a fluid into infected spaces forces material into new channels. It is highly important to keep these cases comfortable afterwards with sedatives.

6. Whether to repair nerves or tendons primarily in these cases is a problem. If a repair is chanced primarily, I feel that chromic gut 00 should be used; for if a slough does occur one does not see pieces of silk coming forever. Of course, in clean cases silk is advisable. It is particularly important to remember to splint these cases with moulded plaster splints, in the hyper relaxed positions after repairs, and to apply the splint so that the part can be exposed with ease.

7. No tissue tension should be constantly ringing through one's ears in the closure of contused wounds, otherwise needless destruction of tissue will result.

8. It is highly important to explain to the patient these injuries: that infection is already present, and that nothing "got infected" as the patient will say later. He should have explained to him the reactions that follow administration of serum, *e. g.*, tetanus, and that nerve and tendon unions are often troublesome, that physiotherapy will be needed, and long drawn-out observation periods are necessary.

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DUDLEY V. SAELTZER, JR., M. D. (724 Medico-Dental Building, Sacramento).—After observation of some of his many cases, I am led to believe that Doctor Butler has demonstrated uncompromisingly the effectiveness of early, thorough, mechanical cleansing of lacerated wounds. The emphasis should lie on early and extensive debridement, thorough exploration for foreign material and necrotic tissue, and copious irrigation to wash contaminants away. For this purpose literally gallons of sterile salt or weak peroxid solution are needed. Whether strong antiseptics are desirable is widely disputed. In my mind this dispute is irrelevant because, in such hands as Doctor Butler's, the use of non-antiseptic fluids has proved adequate. The principal virtue of peroxid solution is the manner in which its many bubbles suspend small contaminating particles so that they can be washed away. In addition, peroxid colors viable muscle bright red, while severely traumatized tissue remains darker in color. This is of some aid in identifying tissue that should be excised.

Doctor Butler mentions the danger of estimating the extent of injury too conservatively. Certainly, in most lacerations of the hand or wrist thorough exploration for nerve or tendon injuries is indicated. It is surprising how few patients cooperate well enough so that external examination can reveal all of the damage found during later exploration. This tendency toward underestimation of severity of injury also appears where there are found crushing and tearing accompanying simple laceration. In such cases the relatively small skin wound may cover extensive areas of traumatized, contaminated muscle. In all such instances, the skin wound should be enlarged to any extent required so that all deeper areas can be explored, debridement done and cleansing effected.

Another point: it has been my experience that a single prophylactic dose of tetanus antiserum may be

insufficient. This dose should be repeated in two weeks. The reason is that one may find the wound contaminated with tetanus bacilli early, although symptoms do not appear until later when the effect of the primary dose has worn off. Furthermore, the conventional dose of polyvalent gas bacillus antiserum is not large enough. When the injury warrants administration of anaerobic antiserum, a much larger primary dose should be given (at least 10,000 units of the B. Welchii fraction) for prophylaxis.

The ideal in these cases is primary suture resulting in primary healing without infection. This can be accomplished in most cases where there is enough untraumatized skin to close the wound comfortably; provided, of course, that they are treated early and adequately. When the loss of tissue is so great that primary suture is impossible, or when the wound is so old that suture is undesirable, then one should rely on some form of continuous antisepsis, such as the method of Carral and Dakin.

## POLIOMYELITIS—THE LOS ANGELES EPIDEMIC OF 1934\*

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II†

### CONVALESCENCE

CONVALESCENCE was rapid and complete in a majority of cases. In others it was very slow. Although, on the average, the cases were very mild, the treachery of the disease was outstanding, some cases suffering repeated relapses, with painful muscle spasms, long after they were apparently over the acute stage and convalescing. So striking was the latter phenomenon, and so severe were the systemic symptoms, as to suggest reinfection from some obscure focus within the body. Two boys made apparent recoveries from bulbar infection involving the nuclei of the ninth and eleventh nerves, but died suddenly with more extensive medullary reinfection. One nurse recovered from a typical, mild attack, and after a month's convalescence at her home was rushed back to the hospital and a respirator, with a sudden relapse involving the intercostal and phrenic nerves. Equally striking was the rapid and apparently complete recovery of some cases which appeared early to be doomed to extensive residual paralysis. Although all showed some degree of general weakness at the time of discharge, due perhaps to the enforced idleness and bed rest, only 20 per cent have shown any paralysis or paresis to date. Many of these will no doubt ultimately recover. Remote sequellae of a psychasthenic or neurasthenic nature were more common than previously noted. Some patients complained of insomnia, or suffered from nightmare. Others were consciously irritable or emotionally unstable, and some complained of mental fatigability with poor power of concentration. The syndrome of neuro-circulatory asthenia was not uncommon, with symptoms of a sudden weakness, vertigo, palpi-

tation and breathlessness, probably due to sudden lowering of vascular tension incident to sympathetic nervous system dysfunction. Localized, recurrent edema was further evidence of vasomotor (sympathetic) instability. Trophic disturbances were seen which indicated vascular or endocrine changes, but which were probably due to primary sympathetic system involvement. These included excessive growth of the nails on one hand, with retarded growth on the other; hypertrichosis of the legs only, on a girl previously without hair on her extremities; and the case of a man showing loss of pigment of the hair of one involved extremity and not of the other. Herpes was a common sequel, probably due, as in other types, to posterior horn-cell infection, but possibly due to vasomotor phenomena.

### LABORATORY FINDINGS

Of the laboratory findings, only the spinal fluids need be mentioned. The dictum that a preparalytic diagnosis is made on a "healthy suspicion confirmed by spinal fluid findings," is no longer tenable. We reported, in 1930,<sup>1</sup> 12.6 per cent negative spinal fluids in neurologically proved cases. We also learned that a still larger percentage were negative if done too early. This year we withheld punctures until the first neurological signs appeared, and repeated them as indicated by the clinical progress of the case. Approximately 33 per cent of neurologically positive cases showed negative spinal fluids at all times. Others showed cell counts under ten, but with significant increase in pressure or positive precipitation in the colloidal-benzoin or colloidal gold tests. Cells, when present, were predominantly lymphocytes. In 1930 we thought that the colloidal benzoin "curve" was characteristic in poliomyelitis, and could be differentiated from that of tuberculous meningo-encephalitis. Both diseases cause positive precipitations, but the type of curve may be similar in each. Poliomyelitis tends to show a reaction in the middle tubes, and tuberculous disease in the last ten tubes; but the two overlap too often to permit much differential value being placed on the test. In epidemic encephalitis the test is characteristically negative. In this epidemic it was negative in 51 per cent of neurologically positive cases of poliomyelitis, some of which showed other spinal fluid changes. The colloidal-gold test, on the other hand, was positive in fifty-nine out of sixty cases. Apparently, it is a more reliable test. In 46 per cent of cases, there was no increase in spinal fluid pressure. An interesting observation in this connection was the sudden relief from headache or abdominal pain afforded by spinal puncture, even in the absence of increased intrathecal pressure. Our explanation is the probable relief of cellular edema about the posterior horn-cells, or nerve roots, occasioned by shifting of balanced osmotic pressures between the spinal fluid and the perineural circulation or lymph. The shift being toward the spinal canal would tend to reduce capillary tension; and hence edema, even though the osmotic balance between the two systems had been established at a low level.

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